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PL; Fedczyszyn, Zdzisław, Zawiercie, PL**
- 15 54 **Needle protection device**
- 57 **The needle protection device is intended in particular for use of disposable
injection needles and has a jacket 20 whose lower portion 1 is connected
inseparably to the needle fastening point 2 or the base of the needle.**
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Description

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The invention relates to a needle protection device, in particular for disposable injection needles.

- 5 For years, multiple use needles, which were usually used in hospitals, were the cause for unintentional infections with jaundice. For this reason the needles, which could be used several times, were replaced by disposable needles, which actually reduced the risk, but could not eliminate it. The number of infections caused by a needle is quite high and amounts to approximately 7 to 30% of all cases. In addition there is the possibility that other infectious diseases are transmitted, in particular the HIV virus.

- 15 The needle covers, which were in use so far, have to be taken off and replaced again after use. Among medical staff, unintentional infections arise in particular by replacing the cover, when somebody pricks themselves accidentally with the needle on inserting a needle into the opening of the needle cover. In addition, the needle cover is often mislaid, so that in addition the needle is disposed of without cover, again creating a risk of infection by pricking.

- 20 To dispose of needles, hospitals often use melting devices, which are stationary mechanisms which melt the metal parts of the needle. The weak points of these machines are their energy consumption, their low mobility and the high risk that somebody pricks themselves while they introduce the needles. Neither does a storage box for used needles prevent the risk of infection, since the medical staff still have to carry the needles.

- 25 A needle protection device, which is described in the patent application number P-298823/PCT/Ca 91/00321, is provided with a replaceable cover which is hidden on the side. The syringe comprises a cylinder, a piston and a tube outlet of the syringe for fastening the needle. The tube consists of a projection, which runs counter to the needle and projects inside the cylinder, creating an annular intermediate space between the projection and the cylinder.

- 30 Both on the piston and on the projection, complementary areas are formed

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which allow the piston to be connected to the tube and to pull it into the cylinder after the needle has been used.

In the tube, ventilation lines are provided, which connect the central line in the tube to the annual intermediate space, and as a result of which air can be
5 withdrawn from the cylinder as soon as the liquid was introduced prior to an injection. In order to withdraw the air to the outside, the syringe can be put into an upright position in which the needle points upward, so that the ventilation lines are in the top position within the cylinder, as a result of which the air is drawn to the outside.

10 The syringe is constructed in such a way that the needle is withdrawn into the cylinder after use. This needle protection device can only be used in the case of specially configured syringes which are made up of parts which render production of such syringes technically more complex. When the needles are discarded together with their syringes, large voluminous containers are
15 necessary in medical hospitals.

The object of the invention is to eliminate or at least to minimise the disadvantages of the jackets or covers, of which a great many are used, of disposable needles and of the protection devices of the disposable needles. In order to reach this object, the invention is based on the objective of creating a
20 new needle protection device which, when used, offers effective protection against unintentional pricking with used needles and at the same time prevents re-use of the same needle.

This objective is achieved according to the invention in that the lower portion of the jacket is fastened to the needle fastening point or to the base of the needle.

25 In a preferred embodiment, the lower portion of the jacket is connected in its upper area by means of an elastically hinged element to the upper portion of the jacket which merges essentially at the level of the needle or of the needle tip into a jacket cylinder to which a cover plate is fastened. The cover plate has drive pins which are fastened in an alternating or opposite fashion and which
30 are vertically staggered and engage in openings in the jacket cylinder, while inside the cylinder a gliding collar is provided whose cylindrical portion, which

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penetrates the jacket cylinder, has recesses on the periphery. The recesses are arranged in an alternating or opposite fashion, are of V-shape and form arms of guides for the drive pins of the cover plate, while elastic catches up provided in arms of the guides. The elastic catches border on recesses in the cylindrical portion of the gliding collar.

In the upper portion of the jacket an axially running longitudinal recess is provided which extends from the lower end of the upper portion up to the jacket cylinder. An axially running longitudinal recess is also provided in the lower portion of the gliding collar. A stop element, counter to the axially running longitudinal recesses, is provided on the upper portion of the jacket above the elastic hinge element for centering the injection needle.

The partition line between the lower and the upper portion of the jacket is advantageously angled at 45° .

Preferably the cross section of the upper portion of the jacket is of U-shape.

Conveniently the jacket cylinder has in its upper and its lower external area a shoulder or a flange which projects beyond the cylinder surface. The cover plate is provided between the flanges. The cover plate encloses half the circumference of the jacket cylinder and merges into two straight portions.

In a preferred embodiment the cylindrical guiding collar is connected in its upper portion to a head in whose interior a channel is formed.

The arms of the guides of the drive pins preferably run at an angle of 90° .

Preferably the elastic catches are essentially of triangular shape and connected along one side and the peaks to the guides. The free side, facing the movement direction of the drive pins, of the elastic catches is the longest side of the catch, while the second free side of the elastic catch is somewhat rounded and short.

The cylindrical portion along the upper portion of the jackets has preferably a U-shaped cross section.

The inventive needle protection device, which is intended in particular for disposable injection needles, is connected at the end of a syringe by means of

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the needle fastening point in a stable way and such that it cannot be separated, to the jacket which is provided with a protection locking mechanism with the elastic catches. Due to the elastic hinge element which connects the upper and lower portions of the jacket to one another, the injection needle can be used.

- 5 During the injection the needle is completely uncovered, when the upper portion of the jacket together with the jacket cylinder and the cylindrical gliding collar is pivoted to one side through a comparable obtuse angle of 150°.

- The projection locking mechanism, which is used here, consists of the drive pins on the cover plate and guides in the cylindrical gliding collar, which prevent
10 repeated use of the needle. The axially running longitudinal recesses of the upper portion of the jacket and of the cylindrical portion of the inner gliding collar are staggered in different operating positions or coincide.

- Movement of the cylindrical gliding collar is caused by its rectilinear movement, in particular by pulling out and pressing in the head, which is simultaneously
15 situated at its outer end. The movement conversion from a rectilinear movement into a rotary movement of the cylindrical gliding collar and of the lower cylindrical portion takes place by means of the drive pins, which are fastened in the cylindrical jacket by means of the cover plates, and the V-shaped guides which are provided along the circumference of the cylindrical portion of the
20 gliding collar inside the cylinder jacket.

Movement of the cylindrical gliding collar is possible in only one direction. Return movement is prevented by the elastic catches in the gliding collars, which block the drive pin. Due to the inventive construction the risk of unintentional pricking with the needle is minimized.

- 25 Repeated use of the needle is impossible as soon as the jacket is blocked. The needle jacket is integral with the needle and cannot be mislaid. The needle protection device is simple, easy to use and above all safe. Finally no additional machines as for example a needle melting machine are requisite for the device.

- The invention is described below in more detail with reference to figures, in
30 which:

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Figure 1 shows a partially vertically cut side elevation of a needle protection device for a disposable needle;

Figure 2 shows a side elevation of the needle protection device of figure 1;

Figure 3 shows the needle protection device of figure 1 in a laterally pivoted position;

Figure 4 shows a vertical section of the upper portion of the needle protection device in a starting and an end position;

Figure 5 shows section A-A of figure 4;

Figure 6 shows section B-B of figure 4;

Figure 7 shows section C-C of figure 4, while the needle protection device is in its starting position;

Figure 8 shows section C-C of figure 4, while the needle protection device is in its end position;

Figure 9 shows a partially vertically cut elevation of the need a protection device of figure 1 in an intermediate position which permits pivoting of the upper portion of the needle protection device;

Figure 10 shows section D-D of figure 9;

Figure 11 shows section E-E of figure 4 in figure 9;

Figure 12 shows a developed view from 0 to 360° of the upper portion of the cylindrical gliding collar with guides.

The needle protection device for a disposable needle has a jacket 20 in the shape of an elongated cylinder, which cylinder consists of a lower portion 1 which is attached to the fastening point 2 of the needle 3, and the upper portion 4 which is connected by means of an elastic hinge element 5. The partition line of the lower portion 1 of the jacket 20 and of the upper portion 4 of the jacket 20 is inclined upward from the hinge point by 45° relative to the horizontal. The jacket 20 has the an axially running longitudinal recess 6 which extends from

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the fastening point 2 of the injection needle 3 and which is somewhat wider than the diameter of the needle 3. The upper portion 4 of the jacket 20 has a U-shaped cross section and merges at the level of the needle tip into a jacket cylinder 7. The jacket cylinder 7 has no longitudinal recess. At the upper and at the lower end of the jacket cylinder 7 there extends outward in each case an outer flange 8 from the surface of the jacket cylinder 7. Inside the flange 8 a cover plate 9 is provided on whose inner surface drive pins 10 are provided which are arranged in an alternating fashion or opposite and are staggered vertically and engage in openings in the jacket cylinder 7. The cover plate 9 encloses half of the circumference of the jacket cylinder 7 and merges into two straight portions. The upper portion 4 of the jacket 20 has, somewhat above the elastic hinge element 5 on the inner surface, opposite the longitudinal recess 6, a stop element 11 which engages on the needle for centering. Inside the jacket cylinder 7 a cylindrical gliding collar 12 is provided which at its top side is connected to a head 13 which has a channel 14 which permits entry of gas during sterilization of the needle 3. The head 13 has a rounded outer surface, and its diameter is larger than the diameter of the upper flange 8 of the jacket cylinder 7. The cylindrical portion of the gliding collar 12, which passes through the jacket cylinder 7, has along its circumference two recesses which are arranged in an alternating fashion or opposite, are of V-shape and whose arms enclose an angle of 90°. The arms form guides 15 for the drive pins 10 of the cover plate 9. The guides 15 have elastic catches 16 and 17 which are in each case arranged in an arm and resemble a triangle. The triangle is fastened with its one side and peaks to the side of the guide 15. On the side of each guide 15 at the point of the elastic catches 16 and 17 recesses 18 and 19, respectively, are provided which are identical in shape to the shape of the elastic catches 16 and 17. The free side, facing the movement direction of the drive pin 10, of the elastic catches 16 and 17 is by comparison the longest side, while the second free side of the elastic catches 16 and 17 is slightly rounded and shorter. The cylindrical portion of the gliding collar 12 below the jacket cylinder 7 and in particular below the tip of the needle 3 almost extends up to the stop element 11 of the upper portion 4 of the jacket 20 and is U-shaped in cross section, since a longitudinal recess extends along its height up to the jacket cylinder 7.

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The injection needle 3, which is shown in figure 1, is presented in two sizes, one extending up to the jacket cylinder 7 and the other slightly above the stop element 11 of the upper portion 4 of the jacket. In the case of the needle protection device for a disposable needle, the injection needle 3 is enclosed in its starting position in the cylindrical portion of the gliding collar 12 which is surrounded by the upper portion 4 of the jacket 20. In the starting position, the head 13 contacts the jacket cylinder 7, the elastic hinge element 5 is blocked in this position of the cylindrical gliding collar 12. In their starting position both drive pins 10 are in the upper location in the left arms of the respective guide 15. The needle 3 is released by the head 13 being lifted upward as far as possible. In the process the cylindrical portion of the gliding collar 12 is rotated into an open position (figure 10) so that the needle 3 is freely accessible. Inside the jacket cylinder 7, the drive pins 10 move in the cylindrical portion of the gliding collar 12 downward in the arm of the guide 15, as a result of which the pressure of the elastic catches 16 is overcome and the elastic catches 16 are forced to one side into the recesses 18, so that the elastic catches 16 can be hidden.

When the drive pins 10 reach the lowest position in the arms of the guides 15, the elastic catches 16 return into their starting position and enter the left arm of the respective guide 15, as a result of which a return movement of the drive pin 10 into the starting position is prevented. In this position, the elastic hinge element 5 automatically opens the upper portion 4 of the jacket 20 together with the jacket cylinder 7. The opening angle is approximately 150°. In this position the needle 3 can be used.

After the needle 3 has been used, the resistance of the elastic hinge element 5 has to be overcome and the upper portion 4 returns into its starting position. The needle 3 is automatically centered by the stop element 11. To protect the needle 3, the head 13 has to be pushed downward as far as possible, which is why the cylindrical portion of the gliding collar 12 rotates inside the upper portion 4 into that position (figure 8), in which the needle 3 is enclosed. Rotation of the gliding collar 12 is caused by the direction of the drive pins 10 which move in the guides 15 of the gliding collar 12. While moving, both drive pins 10 change their position from the lower area of the guides 15 up to the right arm of

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the guides 15 and overcome the resistance of the elastic catches 17. On account of the inclination of the elastic catches 17, they are received in the intermediate spaces 19.

5 After the drive pin 10 has reached its maximum upper position in the right arm of the guides 15, the elastic catch 17 returns into its starting position and enters the right arm of the guide 15, as a result of which a return movement of the drive pin 10 back into its lower position is blocked, so that repeated use of the needle 3 is prevented.

10 In this position the needle is doubly protected: firstly it is located in the cylindrical portion of the gliding collar 12 which is enclosed in the jacket 20, secondly the elastic catches 17 block the movement of the drive pins 10 of the cover plate 9 in the guides 15 of the gliding collar 12.

15 The invention, which mainly resides in the inseparable connection between needle 3 and jacket 20, can be further improved technically and perfected. As an example, the gliding collar 12, as a blocking element, could carry out rotary movements.

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Patent claims

1. Needle protection device, in particular for a disposable injection needle, having a jacket (20), characterized in that the lower portion (1) of the jacket (20) is inseparably connected to the needle fastening point (2) or the base of the
5 needle (3).
2. Device according to claim 1, characterized in that
 - the lower portion (1) of the jacket (20) is connected in its upper area by means of an elastic hinge element (5) to the upper portion (4) of the jacket (20),
 - the upper portion (4) of the jacket (20) essentially at the level of the needle (3)
10 merges into a jacket cylinder (7), to which a cover plate (9) is attached,
 - the cover plate (9) has drive pins (10) which are arranged in an alternating fashion, are staggered vertically and engage in openings in the jacket cylinder (7),
 - there is provided in the jacket cylinder (7) a gliding collar (12) whose cylindrical
15 part passes through the jacket cylinder (7) and has on the circumference recesses, which are arranged in an alternating fashion, are V-shaped and in each case form guides (15) for a drive pin (10) of the cover plate (9),
 - there are provided in the arms of the guides (15) elastic catches (16, 17) which border on recesses (18, 19) in the cylindrical portion of the gliding collar (12),
 - 20 - there is provided in the upper portion (4) of the jacket (20) an axially and vertically running longitudinal recess (6) which extends from the lower end of the upper portion (4) up to the jacket cylinder (7),
 - there is provided in the lower portion of the gliding collar (12) an axially and vertically running longitudinal recess and
 - 25 - there is arranged in the upper portion (4) of the jacket (20) above the elastic hinge element (5) a stop element (11), which centers the needle (3), opposite the longitudinal recess (6).

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3. Device according to claim 1 or 2, characterized in that the partition line between the lower portion (1) and the upper portion (4) of the jacket is inclined by 45°.
4. Device according to claim 2, characterized in that the upper portion (4) of the jacket (20) has a U-shaped cross section.
5. Device according to claim 2, characterized in that the upper and the lower end of the jacket cylinder (7) have an outwardly extending flange (8) which projects beyond the cylindrical surface, the cover plate (9) being provided between the flanges (8).
6. Device according to claim 5, characterized in that the cover plate (9) encompasses half the circumference of the jacket cylinder (7) and merges into two straight portions.
7. Device according to claim 2, characterized in that the cylindrical gliding collar (12) is connected in its upper portion to a head (13) in which a channel (14) is formed.
8. Device according to claim 2, characterized in that the arms of the guides (15) of the drive pins (10) extend at an angle of 90° relative to each other.
9. Device according to claim 2, characterized in that the elastic catches (16, 17) are essentially of triangular shape and are arranged with one side and peaks on the side of the corresponding guide (15).
10. Device according to claim 2, characterized in that the free side, facing the movement of the drive pin (10) of the corresponding guide (15), of the elastic catches (16, 17) is the longest side, while the second free side of the elastic catches (16, 17) is somewhat rounded and shorter.
11. Device according to claim 2, characterized in that the cylindrical portion of the gliding collar (12) has along the length of the upper portion (4) of the jacket (20) a U-shaped cross section.

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4 pages of drawings